Files/JDS
Files

INTERMOUNTAIN STATION
Central Reference File
No. 0.73 X 2.233

Research Note

NORTHERN ROCKY MOUNTAIN
FOREST AND RANGE EXPERIMENT STATION

Missoula, Montana

No. 58

January 5, 1948

RECEIVED
FEB 5 - 1948
RESEARCH
INTERMOUNTAIN

EARLY RESULTS FROM THINNING SEED SPOTS

By Austin E. Helmers

One method of reforestation which has been rather widely tested is to plant from 5 to 25 tree seeds in small prepared spots. Consequently, several seedlings often become established in a single spot. Is it undesirable to have seedlings so closely crowded? Will it be necessary to resort to artificial thinning to reduce the stocking in seed spots? There is very little information on growth of seedlings originating from direct seeding. Results, described below, of experiments in northern Idaho do not completely answer these questions but do show the early effect of density within seed spots on height and diameter growth of seedlings.

The Experiments

Tests of thinning seed spots were made on plots located in the Kalispell Creek drainage in the Kaniksu National Forest (Pend Oreille County, Washington) and in the drainage of the North Fork of the Coeur d'Alene River in the Coeur d'Alene National Forest (Kootenai County, Idaho). The seeding areas were all sown in the fall of 1937 following clear cutting and prescribed burning. Western white pine and ponderosa pine seeds were sown on the Kalispell Creek areas one year after burning. The Coeur d'Alene River areas were sown with western white pine and Engelmann spruce one month after burning.

All seed spots except a very few were thinned to a maximum of 15 seedlings each after completion of germination in the spring of 1938. Alternate spots with seven or more seedlings were thinned to three or four per spot at the end of the second growing season. The same spots were thinned to one seedling each at the end of the third growing season. The alternate unthinned spots contained up to 23 seedlings per spot as a result of second-year germination.

Diameter one inch above the ground line and total height were measured for the dominant seedling in each spot at the end of the ninth growing season.

INT - FILE COPY

Results

The number of seedlings per spot had little effect on height growth of seed spot dominants for any of the species tested (figure 1). Heights of dominant seedlings of Engelmann spruce and western white pine increased very slightly with increase in number of seedlings per spot; ponderosa pine, however, showed a reverse trend.

Diameter one inch above the ground line decreased for all species as numbers of seedlings per seed spot increased (figure 2). The effect was particularly evident for western white pine on the Kalispell Creek areas and for ponderosa pine.

Discussion

The rate and nature of change in height and diameter growth might be a manifestation of the tendency for intolerant species to have greater difficulty than tolerant species in establishing dominance in crowded stands. The height growth of the least shade tolerant species, ponderosa pine, decreased while the height growth of the more shade tolerant white pine and spruce increased with increasing numbers of seedlings per spot. Ponderosa pine sustained the greatest decrease in diameter growth and Engelmann spruce the least as seed spot density increased. White pine, intermediate in the tolerance scale of the three species, was intermediate in reaction of diameter growth to seed spot density.

The differential response in height and diameter growth might also be due simply to the differences in the size of the seedlings of the three species. The ponderosa pine seedlings were approximately twice as tall as white pine and four times as tall as Engelmann spruce seedlings. Thus, competition should be sharpest among the ponderosa pine seedlings, intermediate for white pine, and least among Engelmann spruce seedlings.

Height growth trends observed in this experiment for Engelmann spruce and western white pine agree with the findings of Garman 1/ who reported for ten-year-old Douglas-fir an increase in average height, with an increase in number (up to nine) of seedlings per seed spot. Kummel, Rindt and Munger 2/ suggest that there are disadvantages in having crowded seed spots. One of their text illustrations shows that trees of poor form developed on the periphery of crowded seed spots in a pole-sized stand originating from a direct sowing. The trees were smaller than planted trees of approximately the same age. The present study and the results of Garman 1/ indicate that at least the dominant tree in the seed spot is usually a tree of good form. The seed spot dominants usually well overtop the remaining trees on the spot.

1/ Garman, E. H. 1943. Direct seeding of Douglas-fir. British Columbia Forest Branch. (Typewritten Ms.)

2/ Kummel, Julius F., Charles A. Rindt, and Thornton T. Munger. 1944. Forest Planting in the Douglas-fir region. U. S. Forest Service, 154 pp., illus.

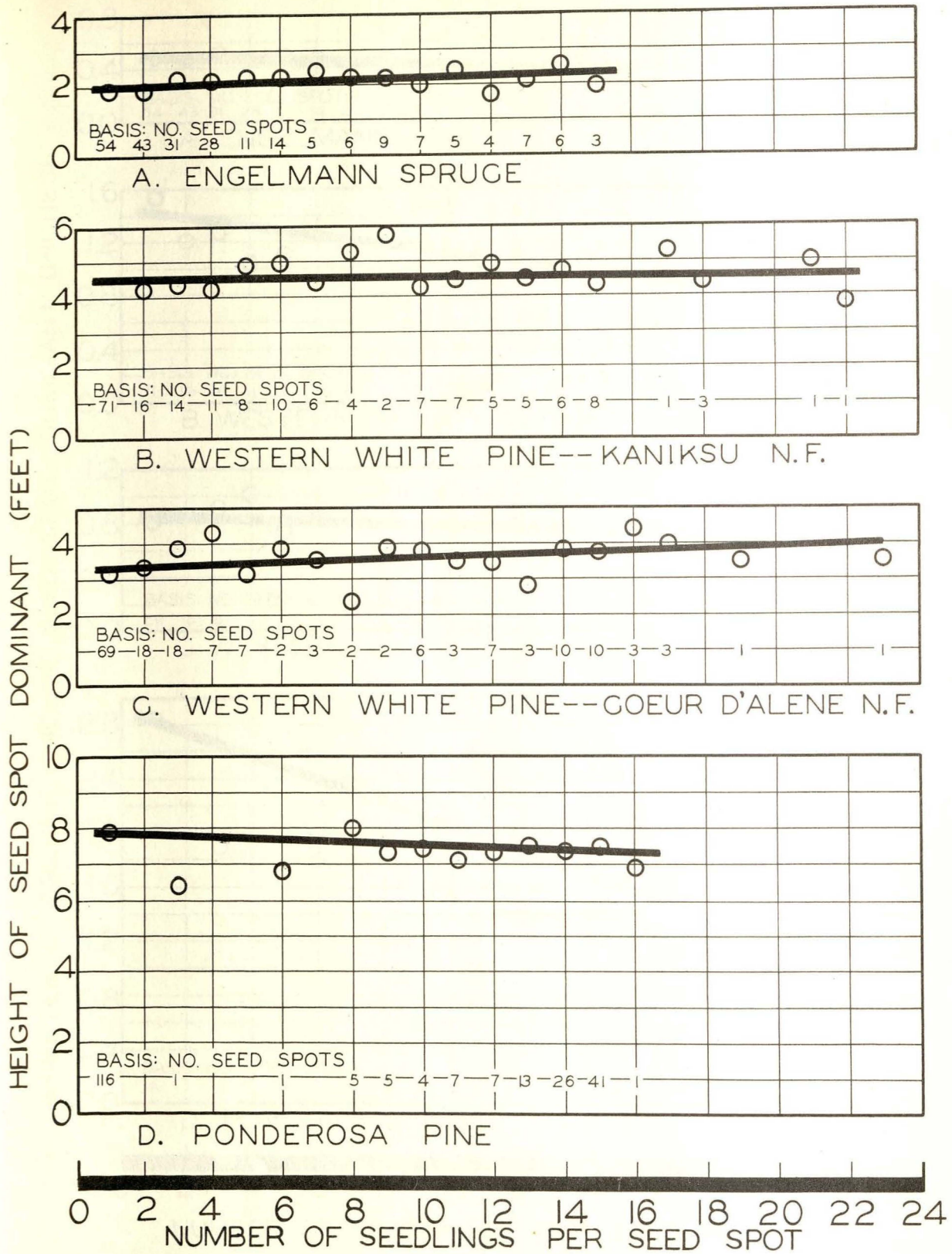
HEIGHT OF SEED SPOT DOMINANT (FEET)
A. ENGELMANN SPRUCE
BASIS: NO. SEED SPOTS
54 43 31 28 11 14 5 6 9 7 5 4 7 6 3
B. WESTERN WHITE PINE--KANIKSU N.F.
BASIS: NO. SEED SPOTS
71—16—14—11—8—10—6—4—2—7—7—5—5—6—8——1—3——1—1
C. WESTERN WHITE PINE--COEUR D'ALENE N.F.
BASIS: NO. SEED SPOTS
69—18—18—7—7—2—3—2—2—6—3—7—3—10—10—3—3——1——1
D. PONDEROSA PINE
BASIS: NO. SEED SPOTS
116——1——1——5—5—4—7—7—13—26—41—1
0 2 4 6 8 10 12 14 16 18 20 22 24
NUMBER OF SEEDLINGS PER SEED SPOT

FIGURE 1.--EFFECT OF NUMBER OF SEEDLINGS PER SEED SPOT ON HEIGHT OF DOMINANT SEEDLING.

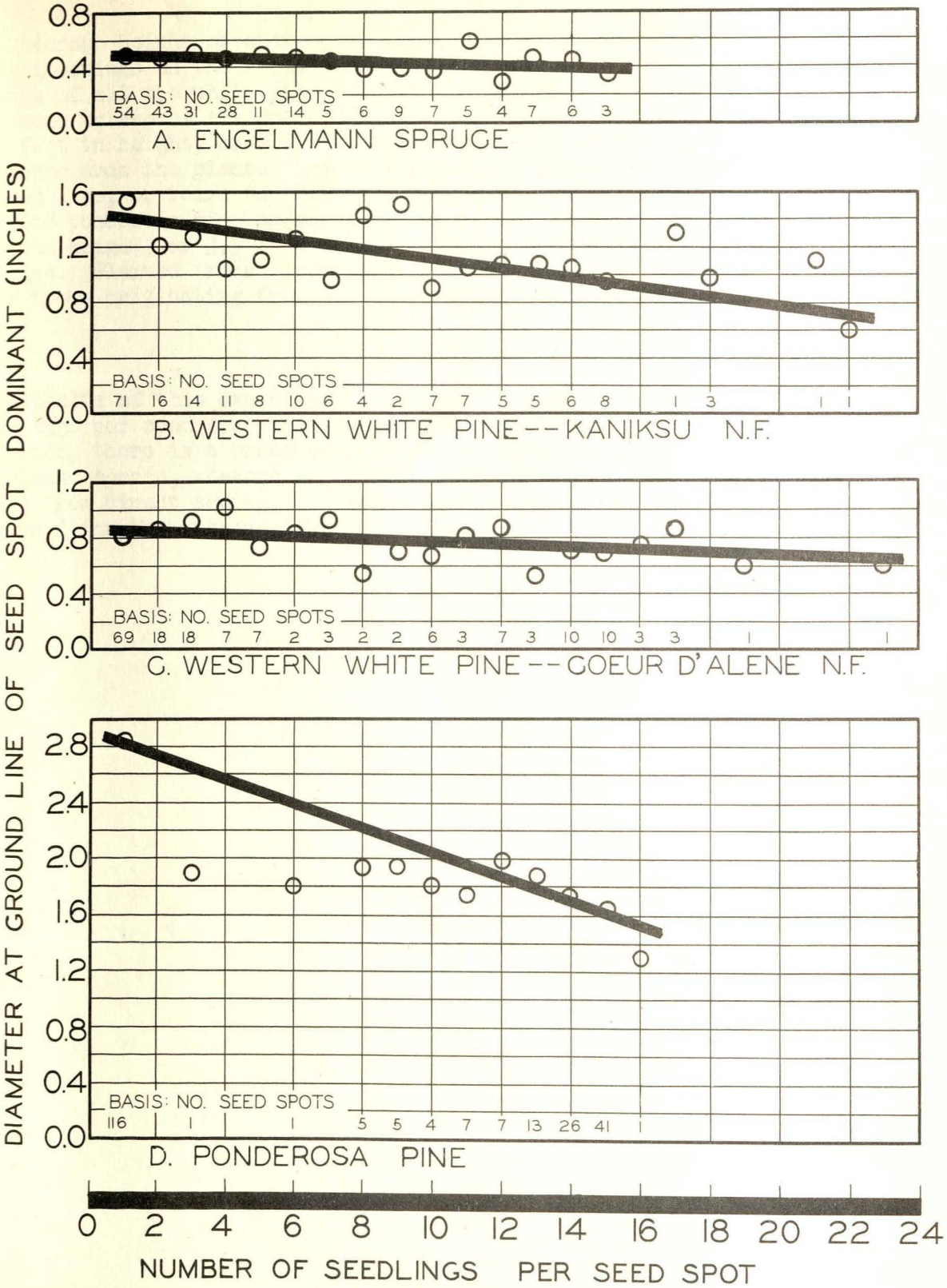
DIAMETER AT GROUND LINE OF SEED SPOT DOMINANT (INCHES)
0.8
0.4
0.0
BASIS: NO. SEED SPOTS
54 43 31 28 11 14 5 6 9 7 5 4 7 6 3
A. ENGELMANN SPRUCE
1.6
1.2
0.8
0.4
0.0
BASIS: NO. SEED SPOTS
71 16 14 11 8 10 6 4 2 7 7 5 5 6 8 1 3 1 1
B. WESTERN WHITE PINE--KANIKSU N.F.
1.2
0.8
0.4
0.0
BASIS: NO. SEED SPOTS
69 18 18 7 7 2 3 2 2 6 3 7 3 10 10 3 3 1 1
C. WESTERN WHITE PINE--COEUR D'ALENE N.F.
2.8
2.4
2.0
1.6
1.2
0.8
0.4
0.0
BASIS: NO. SEED SPOTS
116 1 1 5 5 4 7 7 13 26 41 1
D. PONDEROSA PINE
0 2 4 6 8 10 12 14 16 18 20 22 24
NUMBER OF SEEDLINGS PER SEED SPOT

FIGURE 2. EFFECT OF NUMBER OF SEEDLINGS PER SEED SPOT ON DIAMETER AT GROUND LINE OF DOMINANT SEEDLING.

The average height of white pine trees planted about the same time as the direct sowings on the Kaniksu areas was the same (4.5 feet) as the mean height of all the white pine seed spot dominants. Planted white pine adjacent to one of the Coeur d'Alene River plots, and of the same age, was 5.7 feet in height, or 2.2 feet taller than the direct seeded trees. On the same area the planted trees averaged 1.7 inches in diameter at the ground line, or twice the diameter of direct-seeded trees of the same age. Planted ponderosa pine adjacent to one of the seeding areas averaged 11.2 feet in height, or 3.5 feet taller than the seed spot dominants of the same species. Planted trees apparently maintain a height and diameter advantage over trees originating from direct seeding, at least during the early years.

Summary

The results of this experiment show that although the effect of number of seedlings per seed spot on the height growth is of little practical consequence, there is a pronounced effect on diameter growth of nine-year-old Engelmann spruce, western white pine, and ponderosa pine seedlings originating from direct sowing. These early results do not prove or disprove the need for thinning seed spots.